Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

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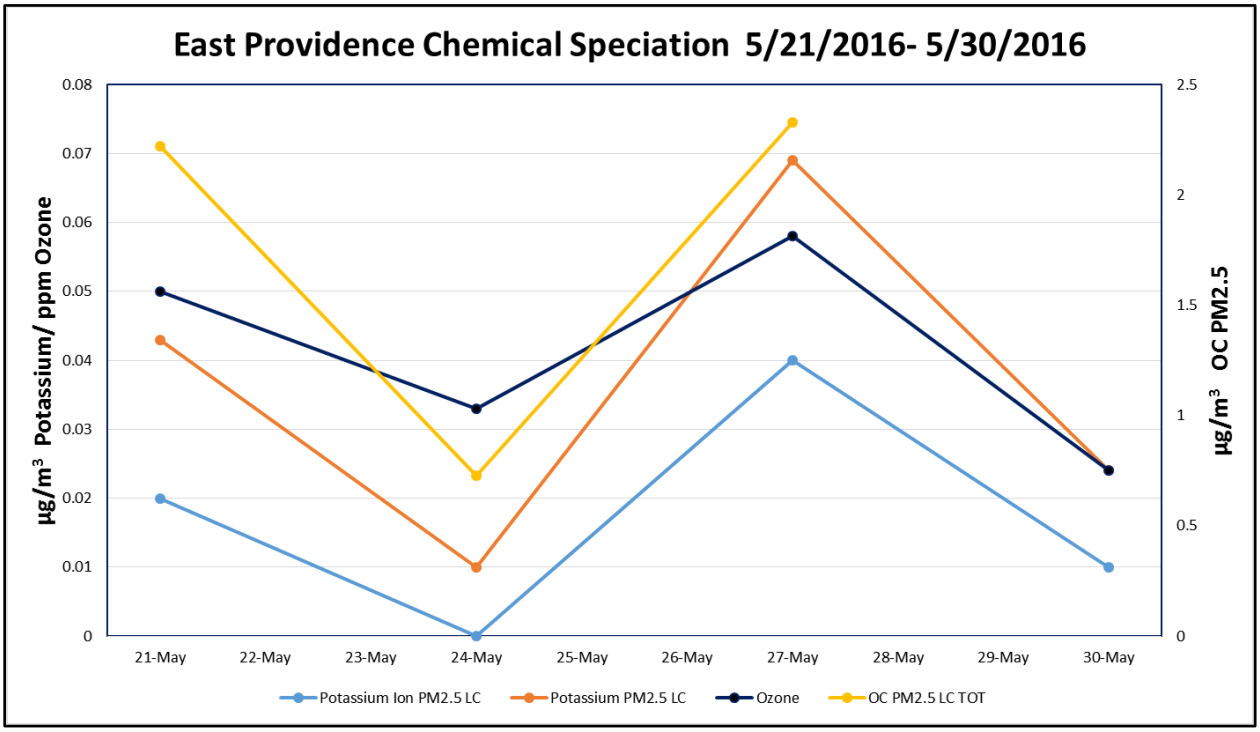
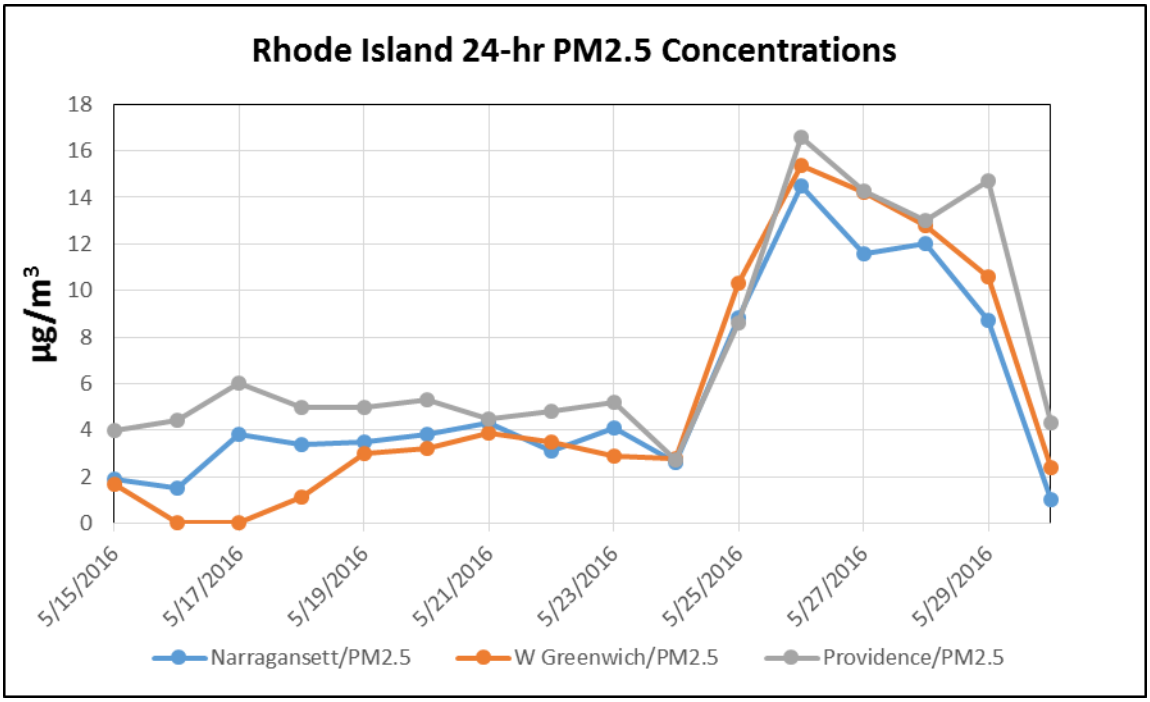
# Response to Recommendations Made From Region 1 EPA

1) *CTDEEP should look at data from sites in Rhode Island, which could help illustrate that smoke and precursors reached areas in Northwest Connecticut. CT DEEP could also provide plots of BC, delta-C, CO, PM2.5, and O3 for non-event days identified in Section 3.3 to assist with comparisons of smoke-induced ozone and non-smoke-induced ozone.*

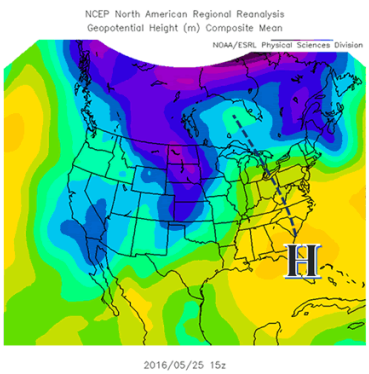
**Response: The East Providence CSN data was presented in the Rhode Island EE Draft Demonstration. It showed a similar pattern as other nearby monitors of elevated potassium, organic carbon and PM2.5 on May 27th along with (moderate) elevated ozone. Since May 25-26, 2016 were not sample days, we felt that including area monitors was not as critical as those from the upwind sites. There is evidence that the plume was still over the area on May 27th, but that the marine layer winds were lowering the ozone levels and thus were not as critical to be flagged. We are including this plot from East Providence to illustrate our conclusion.**

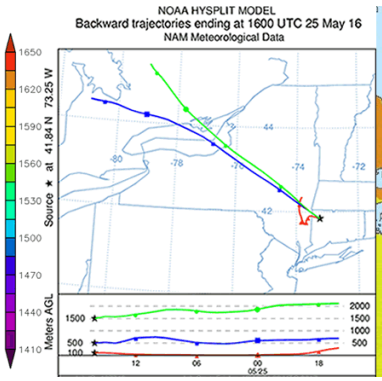


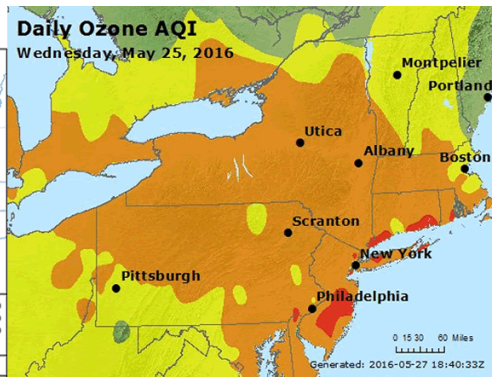

**We also plotted the 24-hour PM2.5 averages for 3 monitors in Rhode Island and found elevated PM2.5 concentrations from May 25-29th, which is similar to what was observed in Connecticut while the smoke plume was present.**

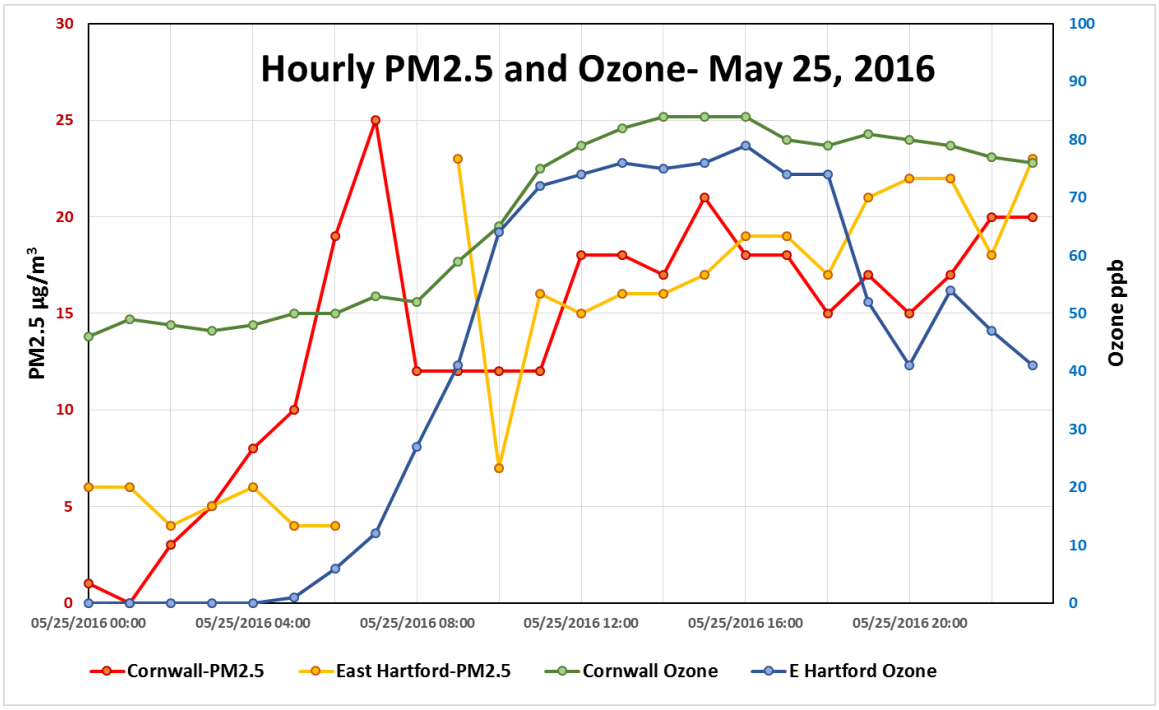


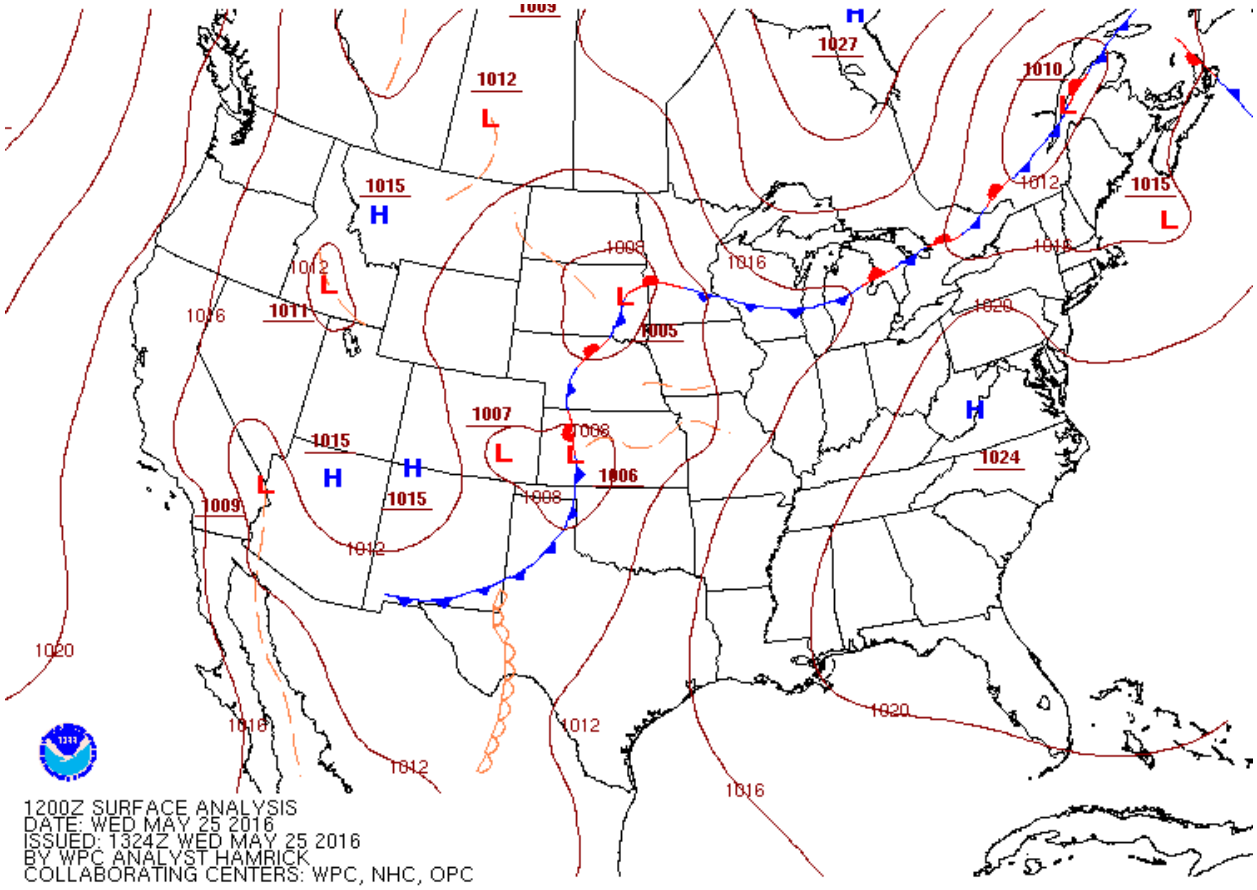

**Response (part 2): In an effort to provide more data for the five similar, but nonevent days that were analyzed, I plotted hourly ozone vs. PM2.5 for the 2 sites that have those parameters collocated (Cornwall and East Hartford). I also provided surface weather maps and visible satellite images with aerosol optical depth (AOD). Although I did not do an in-depth analysis of the wildfire plumes for those days, it is apparent from the AOD that there are aerosol plumes nearby or overhead on each of those days, as is reflected in the elevated PM2.5 levels for some of the hours. As was mentioned in the demonstration, a smoke plume alone doesn't necessarily mean elevated ozone, as the chemistry and residence time are major factors as well as how much of it mixes down to the surface. The May 25, 2016 reference images are presented first and it can be noted that the 2012 and 2013 surface maps most closely resemble that of the reference day, however, the similar days were chosen more for their similarity to the 850 mb pressure pattern and the 500 and 1500 meter back trajectories and not for the surface weather pattern.**

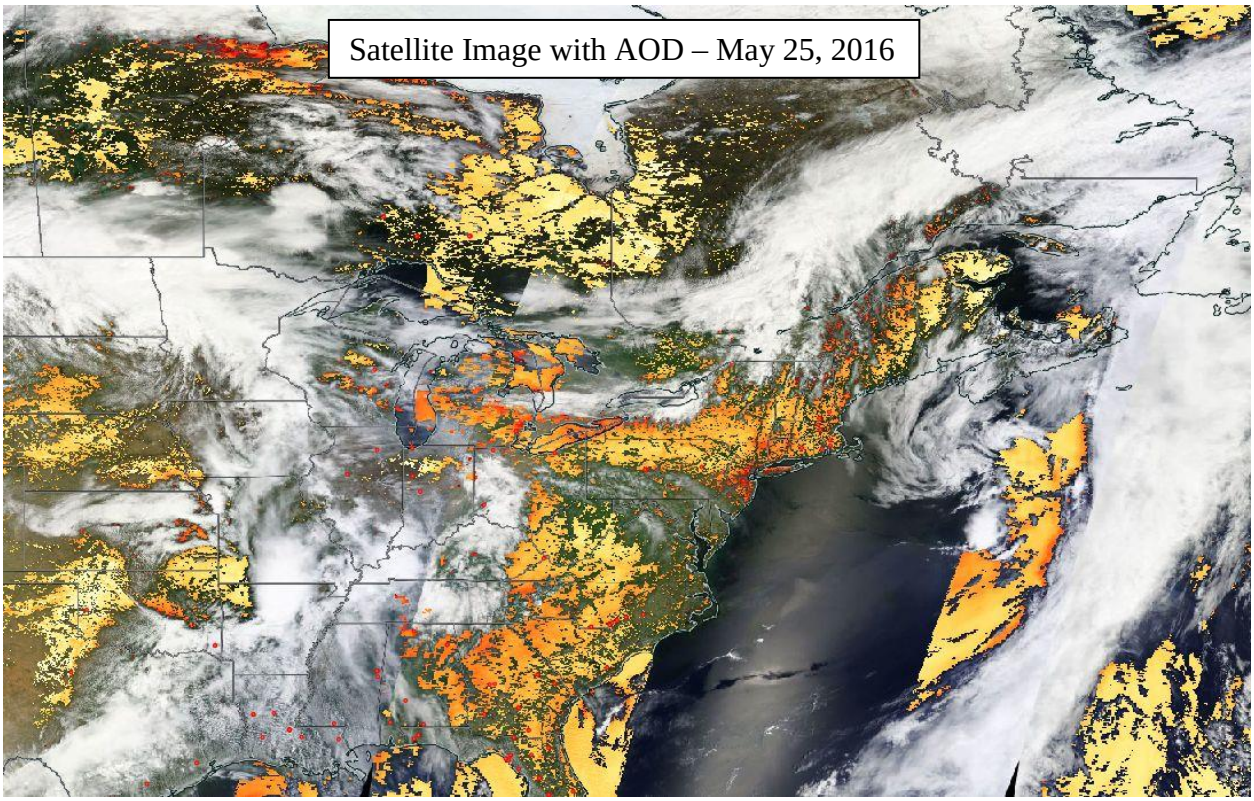


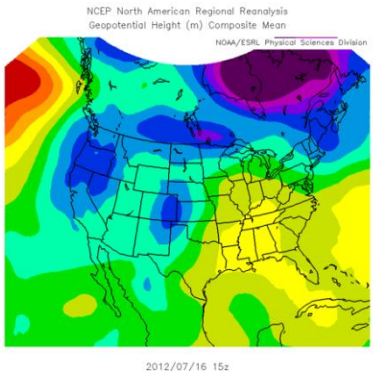



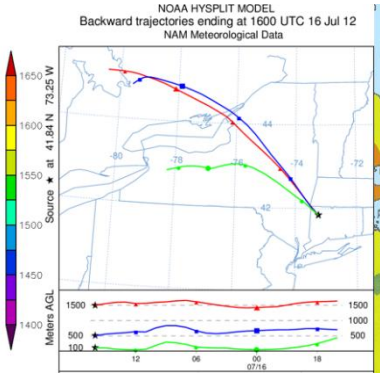




Hourly PM2.5 and Ozone- May 25, 2016
PM2.5 µg/m³
Ozone ppb
30
25
20
15
10
5
0
100
90
80
70
60
50
40
30
20
10
0
05/25/2016 00:00
05/25/2016 04:00
05/25/2016 08:00
05/25/2016 12:00
05/25/2016 16:00
05/25/2016 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone

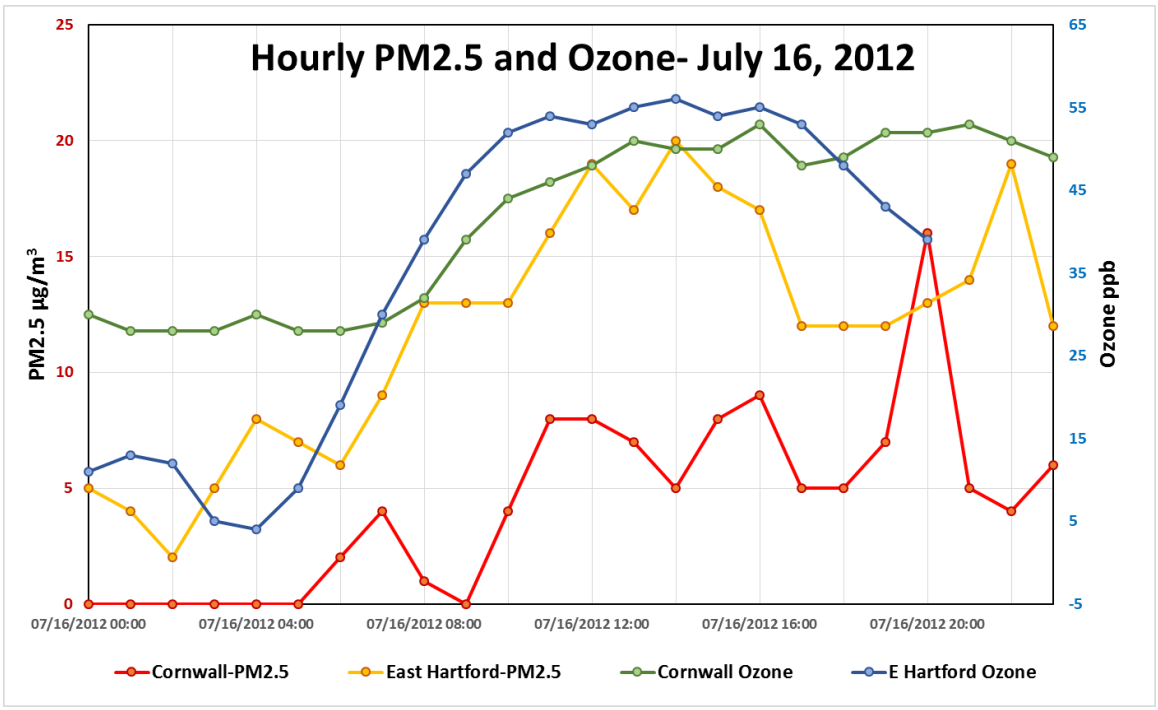

1200Z SURFACE ANALYSIS
DATE: WED MAY 25 2016
ISSUED: 1324Z WED MAY 25 2016
BY WPC ANALYST HAMRICK
COLLABORATING CENTERS: WPC, NHC, OPC

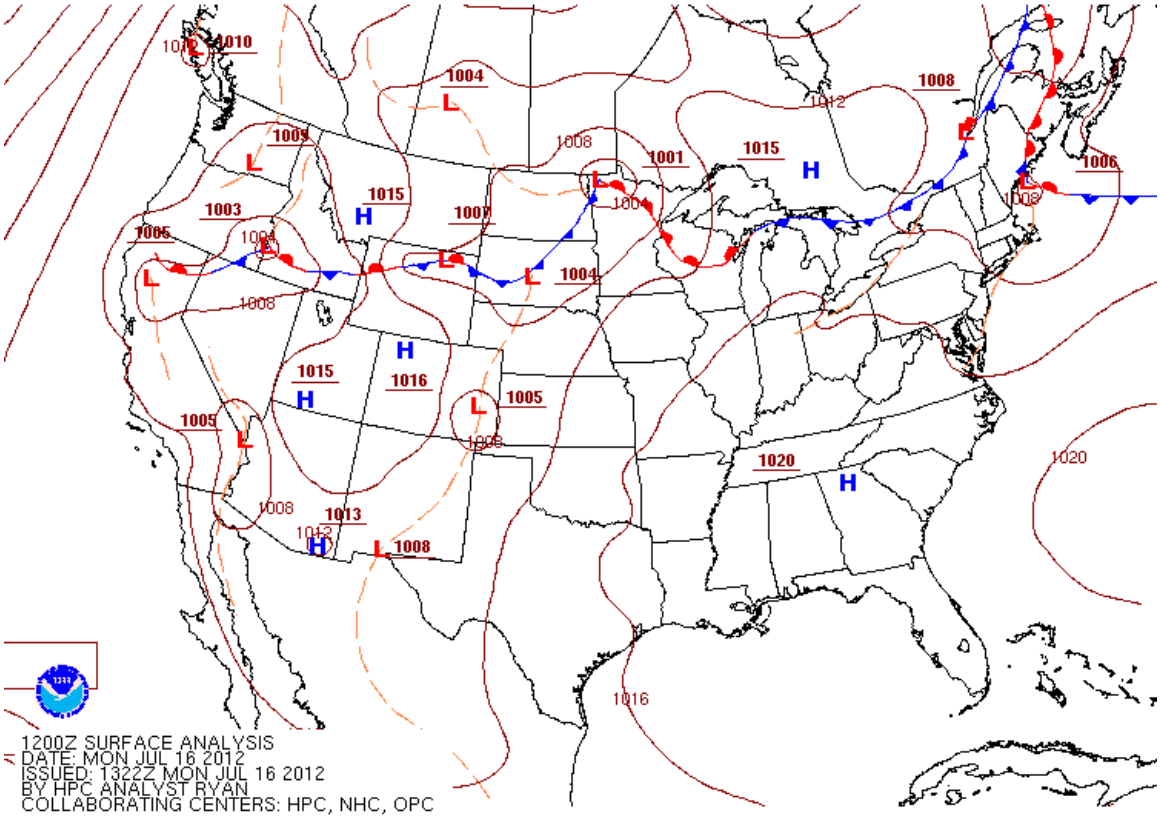

Satellite Image with AOD – May 25, 2016

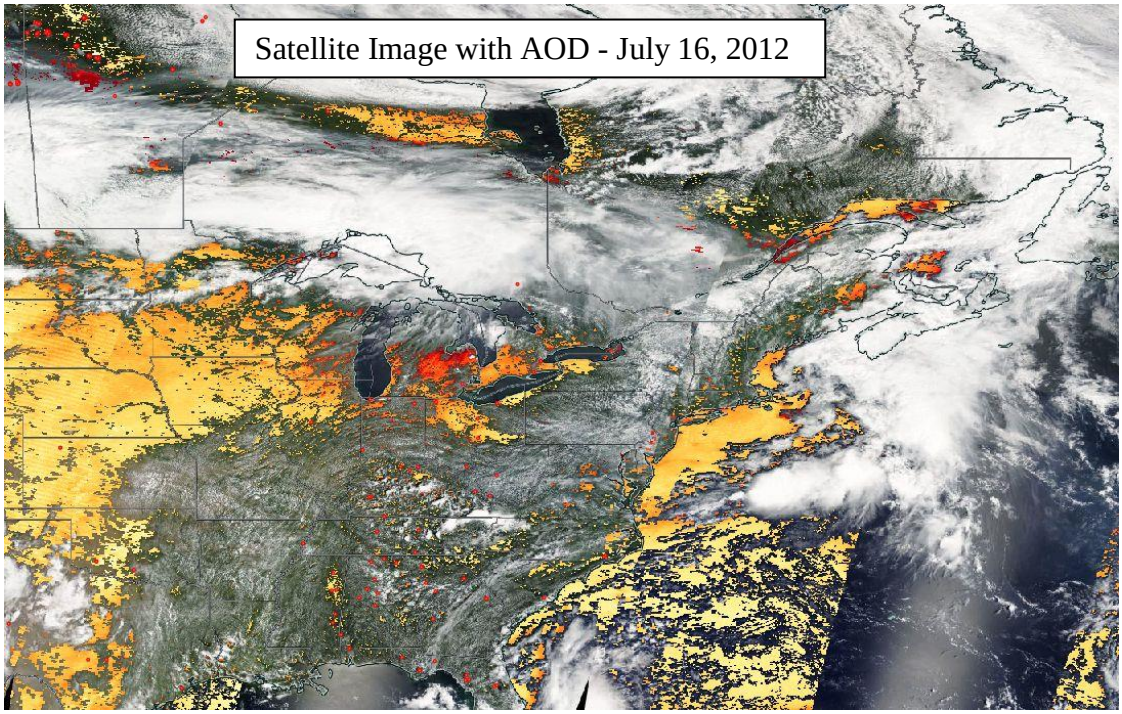

NCEP North American Regional Reanalysis
Geopotential Height (m) Composite Mean
NOAA/ESRL Physical Sciences Division
2012/07/16 15z

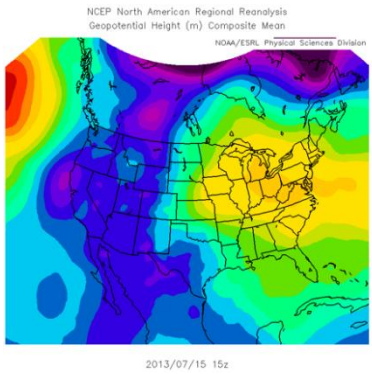

NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 16 Jul 12
NAM Meteorological Data
Source ★ at 41.84 N 73.25 W
Meters AGL
1650
1600
1550
1500
1450
1400
1500
500
100
1000
12
06
00
18
07/16

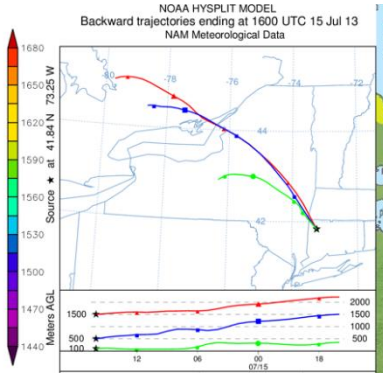
Daily Peak Ozone AQI
Monday, July 16, 2012
Montpelier
Portland
Utica
Albany
Boston
Scranton
New York
Pittsburgh
Philadelphia
0 20 40 80 Miles
Generated: 2012-07-17 19:15:02Z


Hourly PM2.5 and Ozone- July 16, 2012
PM2.5 µg/m³
Ozone ppb
25
20
15
10
5
0
65
55
45
35
25
15
5
-5
07/16/2012 00:00
07/16/2012 04:00
07/16/2012 08:00
07/16/2012 12:00
07/16/2012 16:00
07/16/2012 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone

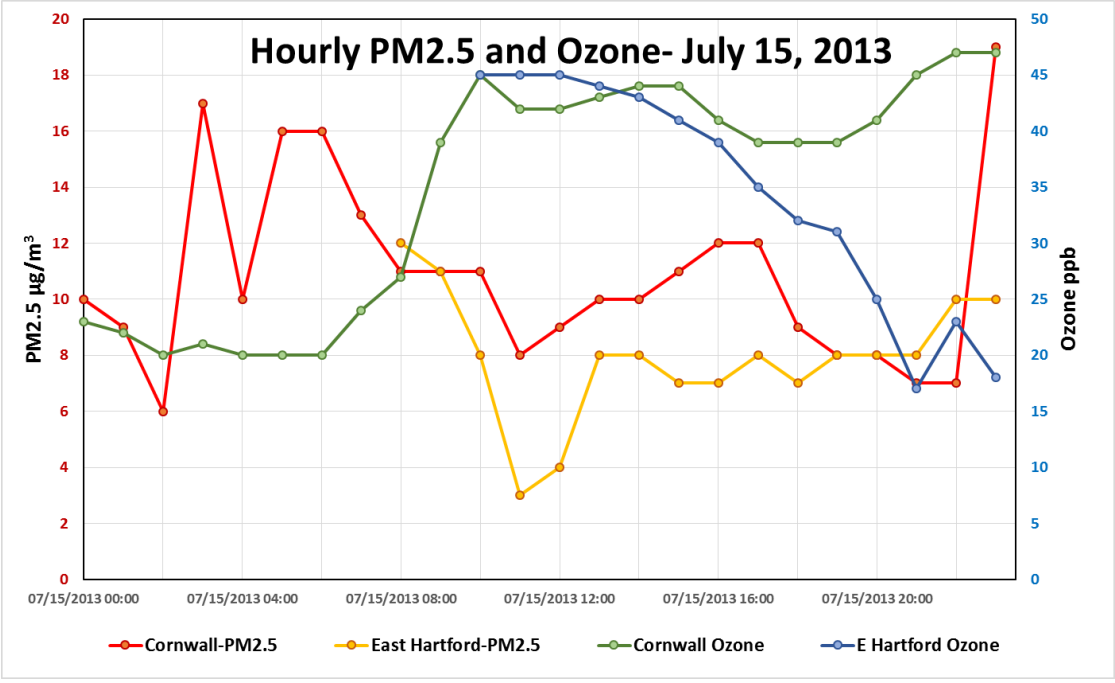

1200Z SURFACE ANALYSIS
DATE: MON JUL 16 2012
ISSUED: 1322Z MON JUL 16 2012
BY HPC ANALYST RYAN
COLLABORATING CENTERS: HPC, NHC, OPC

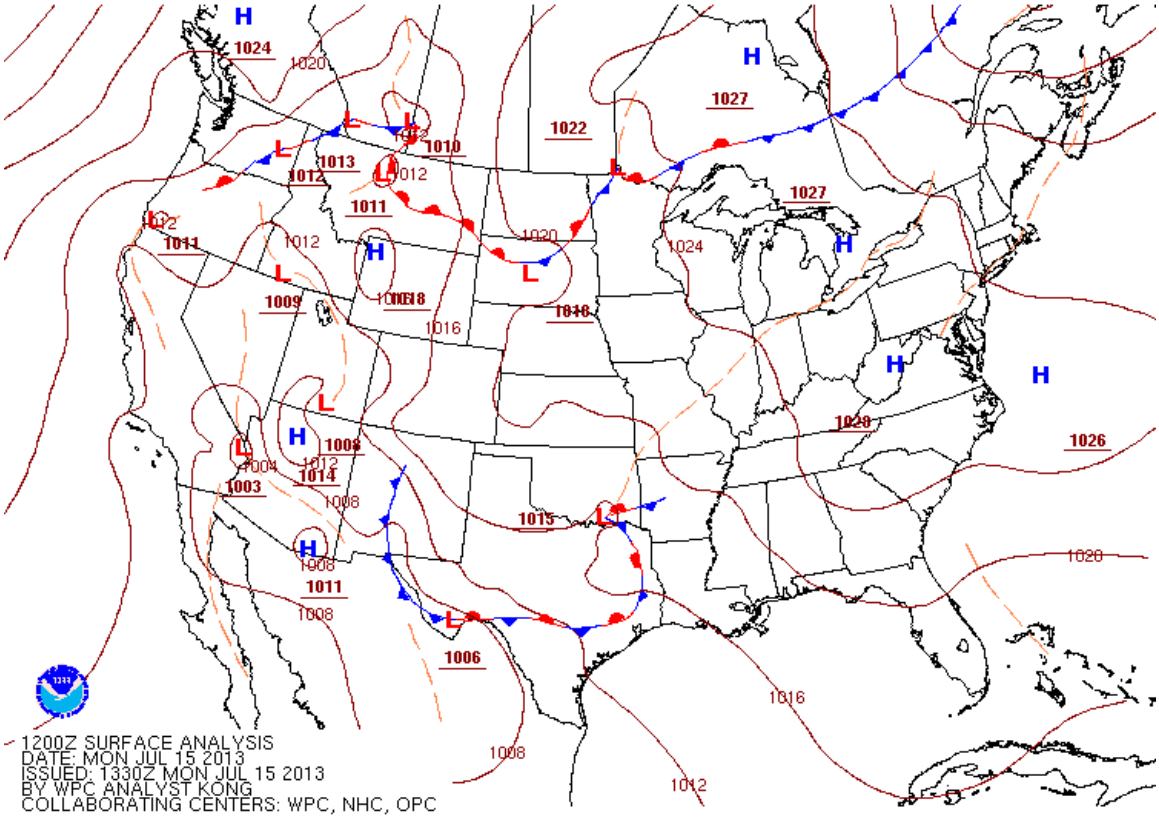

Satellite Image with AOD - July 16, 2012

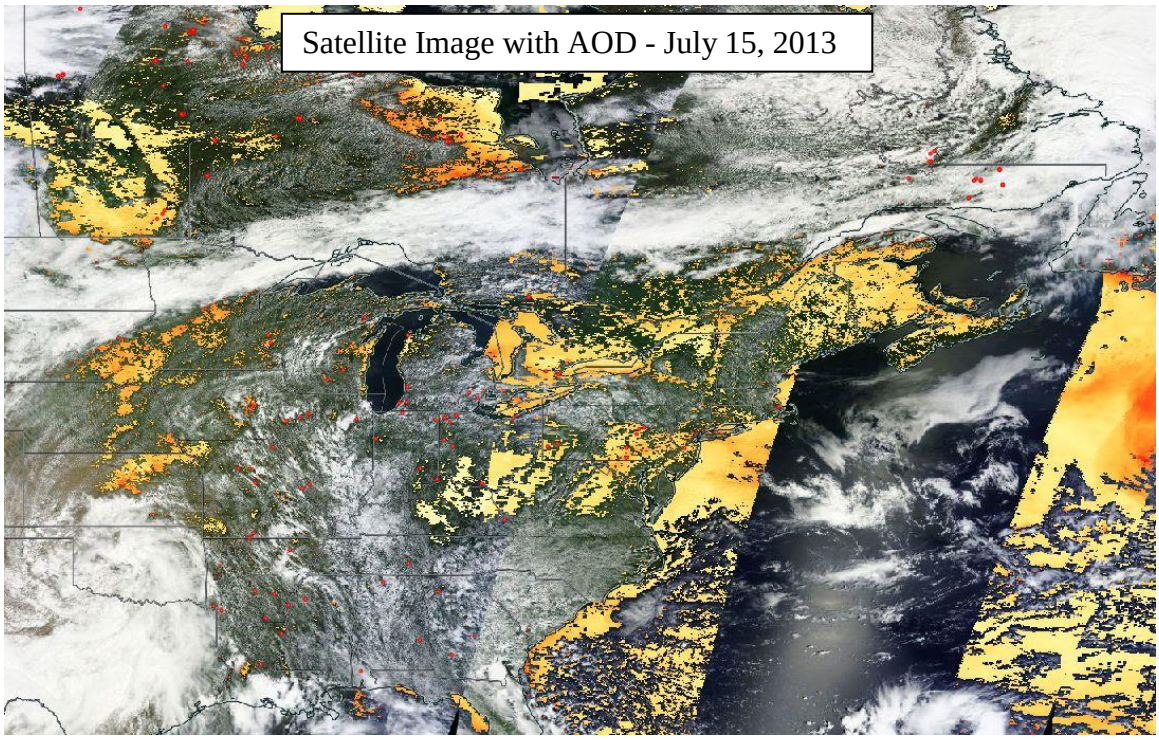

NCEP North American Regional Reanalysis
Geopotential Height (m) Composite Mean
NOAA/ESRL Physical Sciences Division
2013/07/15 15z

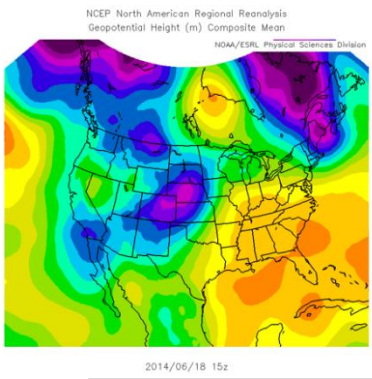

NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 15 Jul 13
NAM Meteorological Data
Source ★ at 41.84 N 73.25 W
Meters AGL

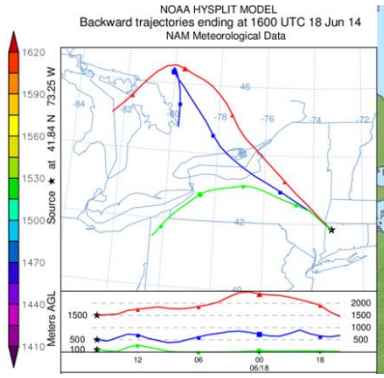
Daily Peak Ozone AQI
Monday, July 15, 2013
Montpelier
Portland
Utica
Albany
Boston
Scranton
New York
Pittsburgh
Philadelphia
0 15 30 60 Miles
Generated: 2013-07-16 14:55:55Z


Hourly PM2.5 and Ozone- July 15, 2013
PM2.5 µg/m3
Ozone ppb
07/15/2013 00:00
07/15/2013 04:00
07/15/2013 08:00
07/15/2013 12:00
07/15/2013 16:00
07/15/2013 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone

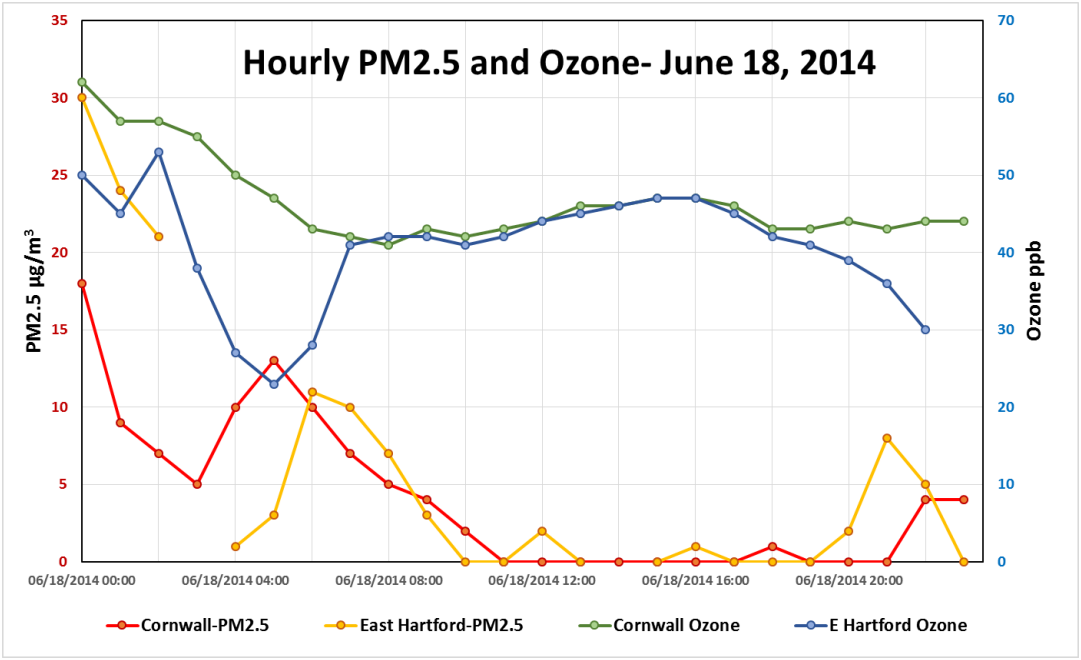

1200Z SURFACE ANALYSIS
DATE: MON JUL 15 2013
ISSUED: 1330Z MON JUL 15 2013
BY WPC ANALYST KONG
COLLABORATING CENTERS: WPC, NHC, OPC

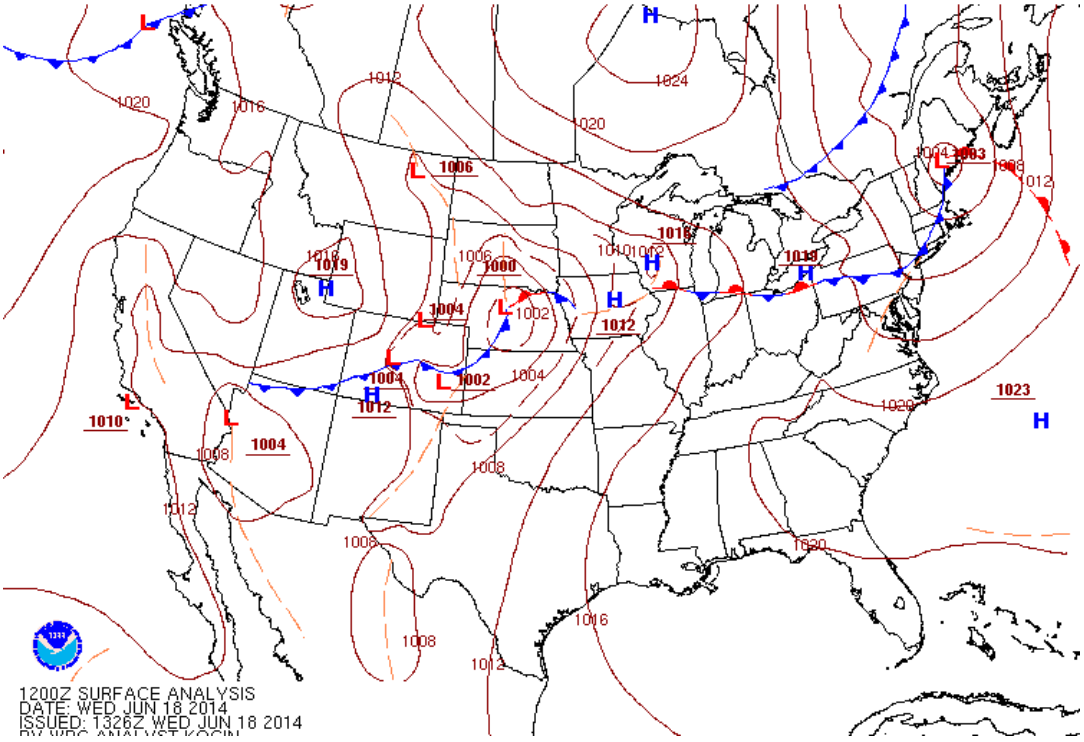

Satellite Image with AOD - July 15, 2013

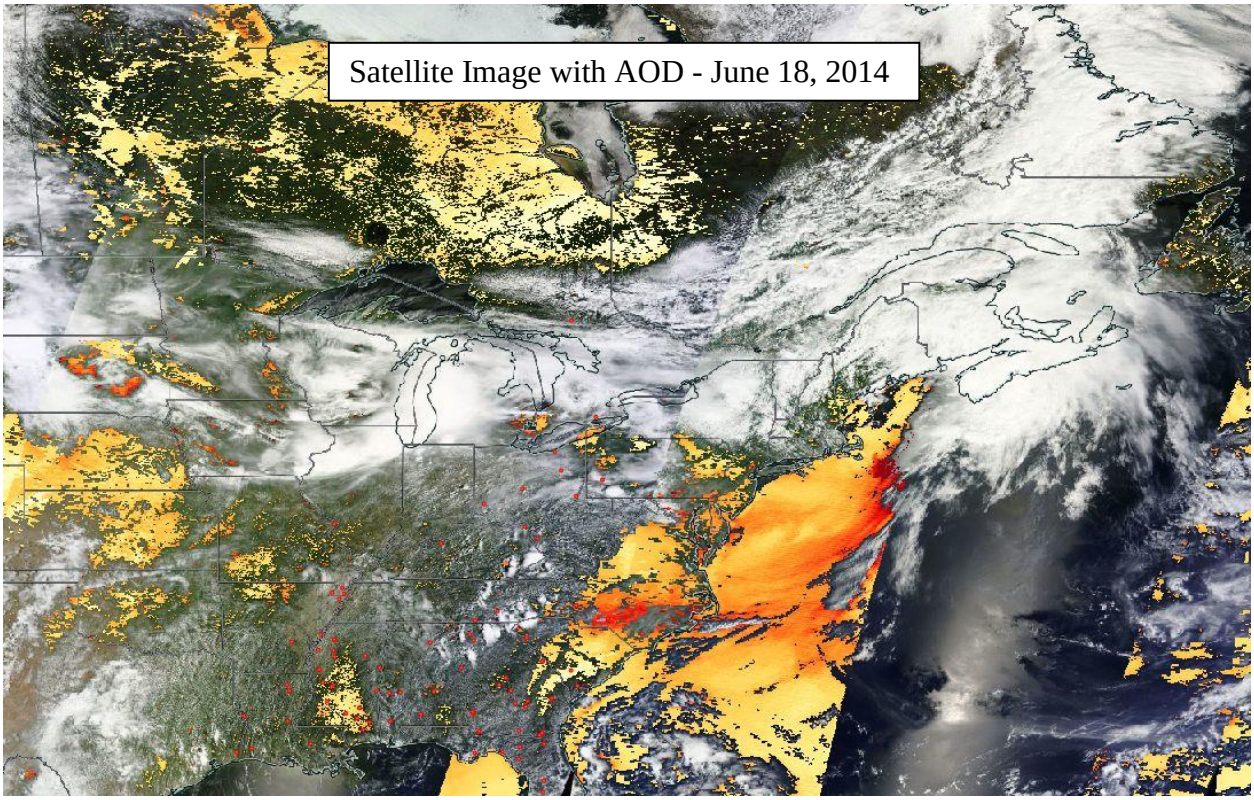

NCEP North American Regional Reanalysis
Geopotential Height (m) Composite Mean
NOAA/ESRL Physical Sciences Division
2014/06/18 15z

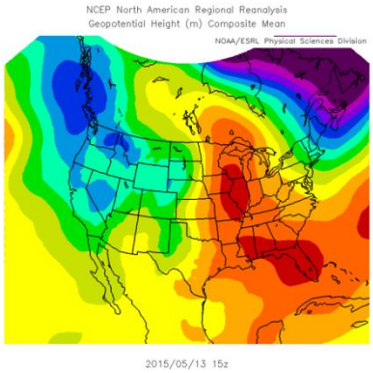

NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 18 Jun 14
NAM Meteorological Data
Source ★ at 41.84 N 73.25 W
Meters AGL

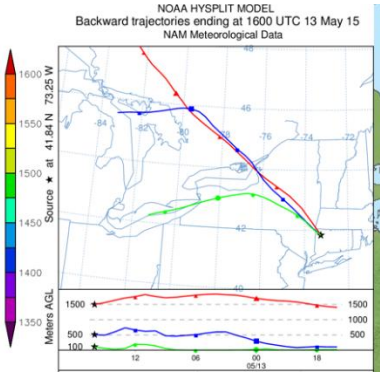
Daily Ozone AQI
Wednesday, June 18, 2014
Montpelier
Portland
Utica
Albany
Boston
Scranton
New York
Pittsburgh
Philadelphia
0 15 30 60 Miles
Generated: 2014-06-19 19:26:15Z


Hourly PM2.5 and Ozone- June 18, 2014
PM2.5 µg/m³
Ozone ppb
06/18/2014 00:00
06/18/2014 04:00
06/18/2014 08:00
06/18/2014 12:00
06/18/2014 16:00
06/18/2014 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone

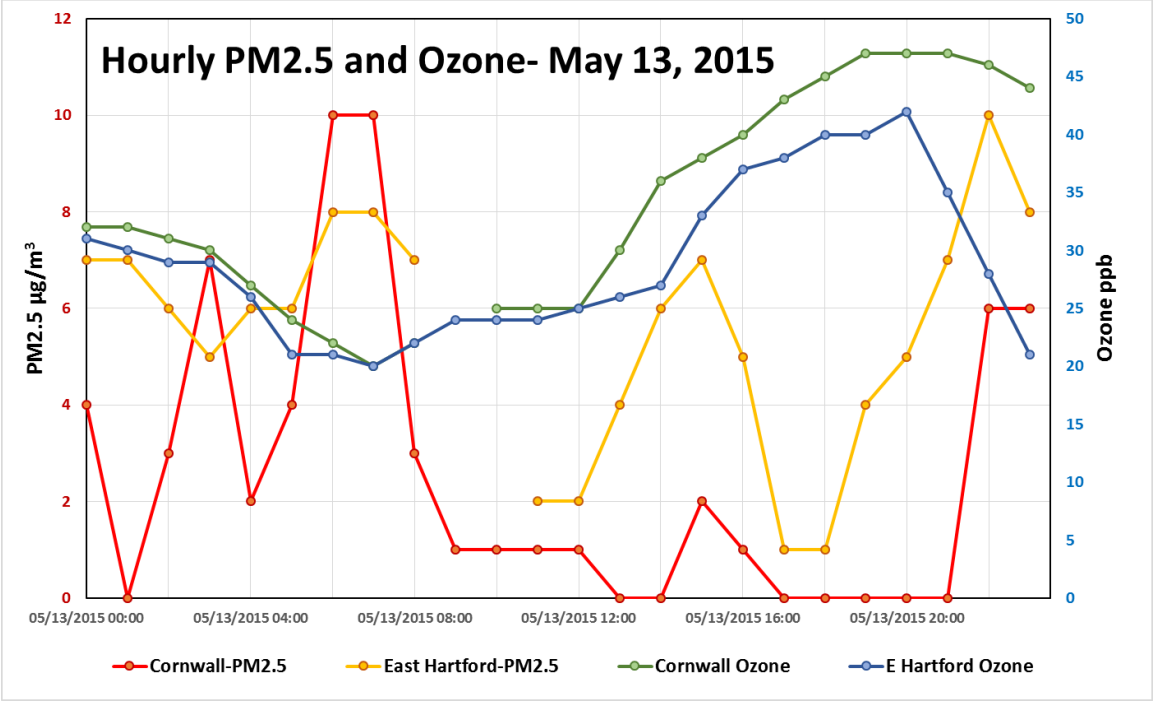

1200Z SURFACE ANALYSIS
DATE: WED JUN 18 2014
ISSUED: 1326Z WED JUN 18 2014

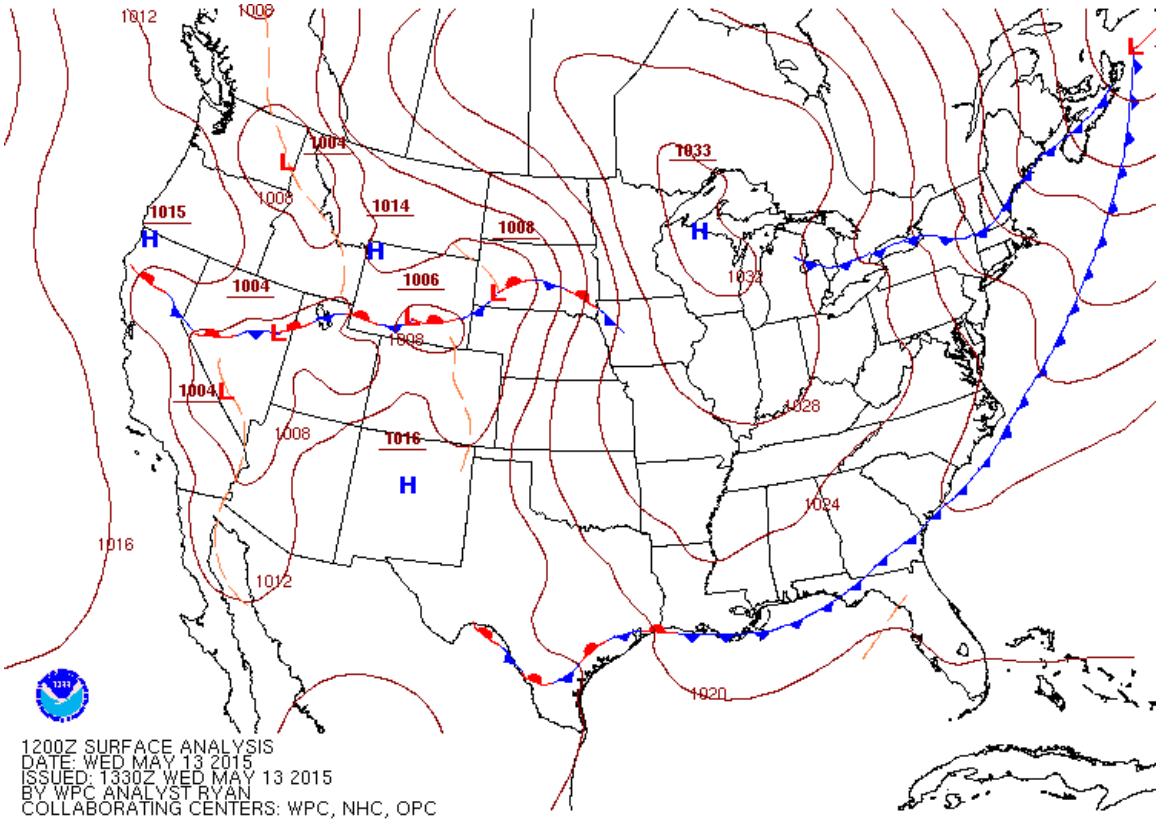

Satellite Image with AOD - June 18, 2014

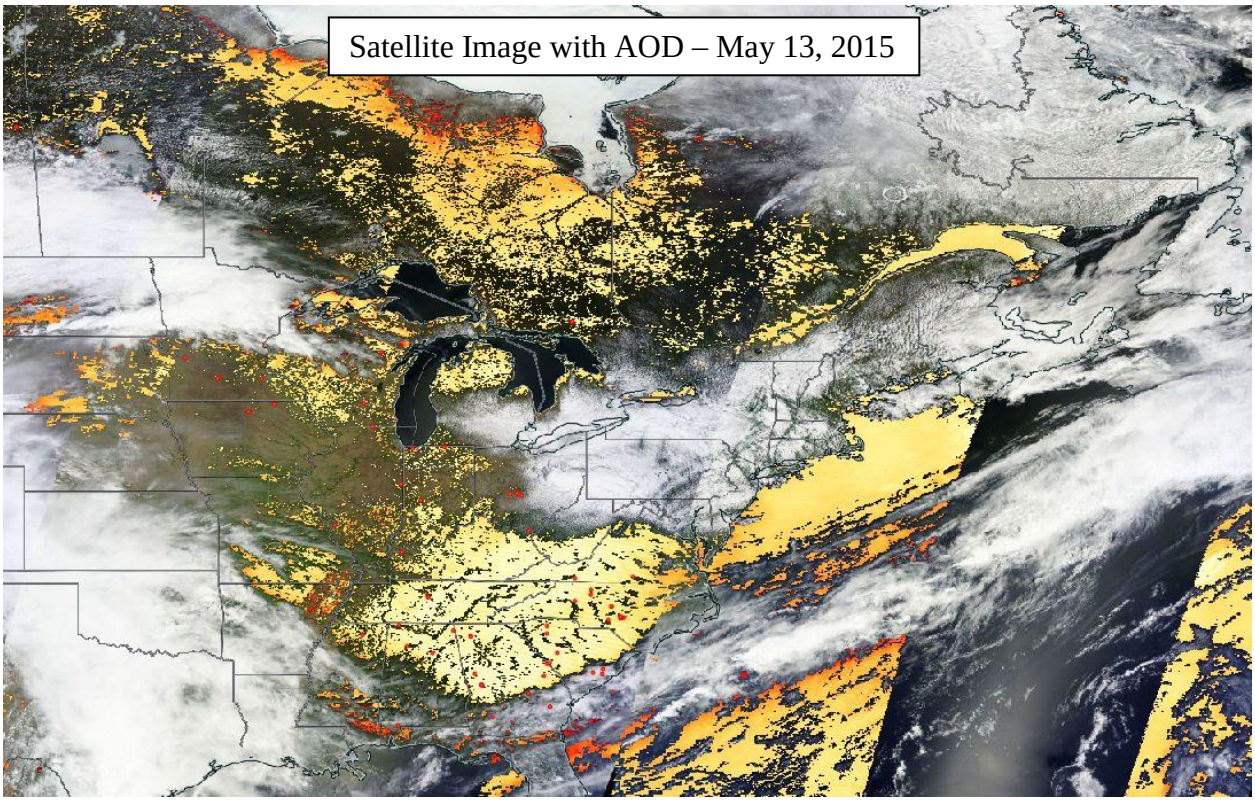

NCEP North American Regional Reanalysis
Geopotential Height (m) Composite Mean
NOAA/ESRL Physical Sciences Division
2015/05/13 15z

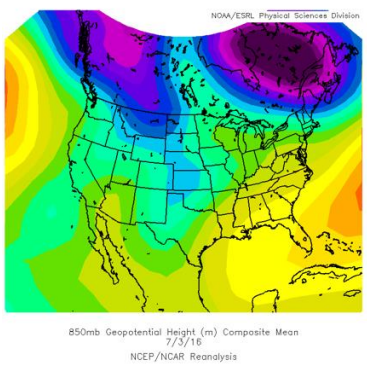

NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 13 May 15
NAM Meteorological Data
Source ★ at 41.84 N 73.25 W
Meters AGL
1600
1550
1500
1450
1400
1350
1500
500
100
1500
1000
500
12
06
00
05/13
18

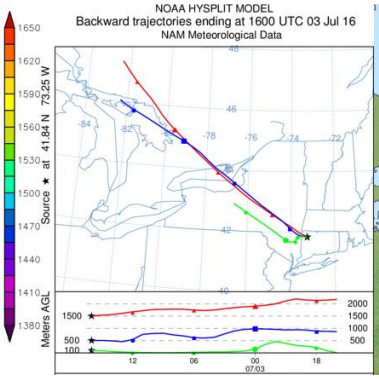
Daily Ozone AQI
Wednesday, May 13, 2015
Montpelier
Portland
Utica
Albany
Boston
Scranton
New York
Pittsburgh
Philadelphia
0 15 30 60 Miles
Generated: 2015-05-14 19:00:48Z


Hourly PM2.5 and Ozone- May 13, 2015
PM2.5 µg/m³
Ozone ppb
05/13/2015 00:00
05/13/2015 04:00
05/13/2015 08:00
05/13/2015 12:00
05/13/2015 16:00
05/13/2015 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone

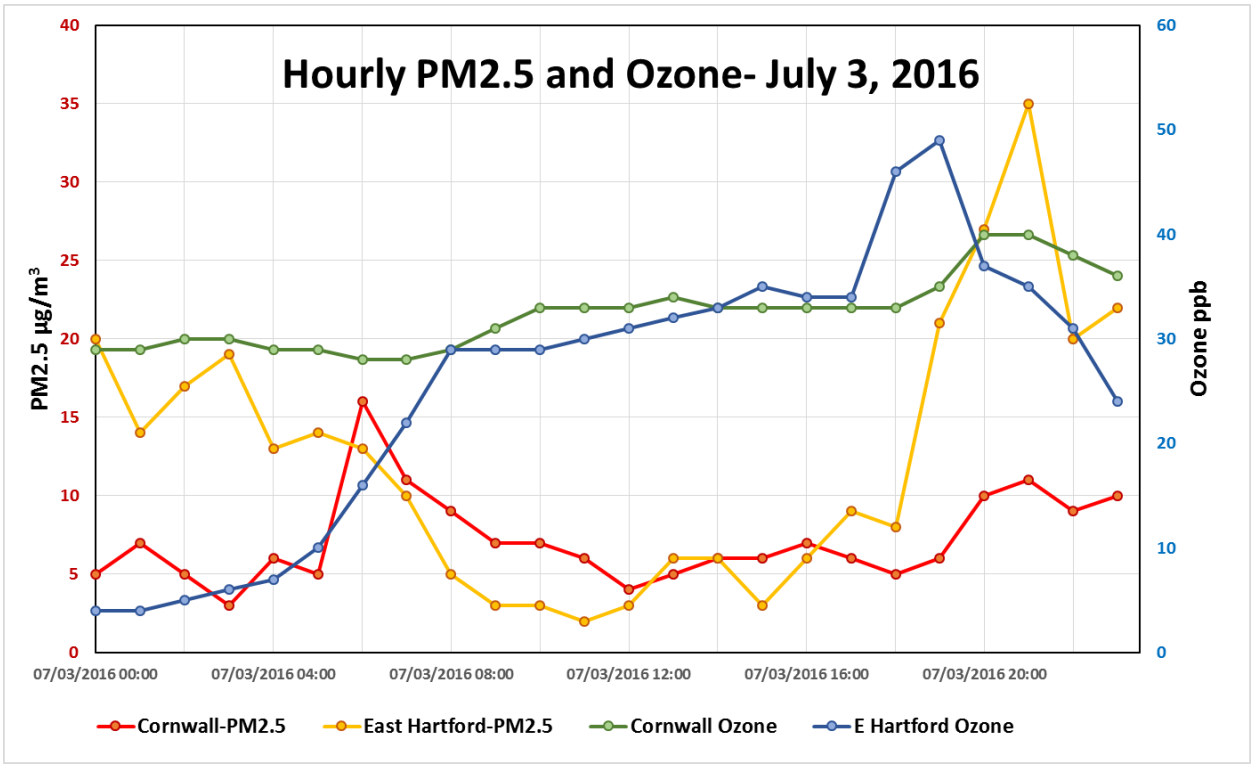

1200Z SURFACE ANALYSIS
DATE: WED MAY 13 2015
ISSUED: 1330Z WED MAY 13 2015
BY WPC ANALYST RYAN
COLLABORATING CENTERS: WPC, NHC, OPC

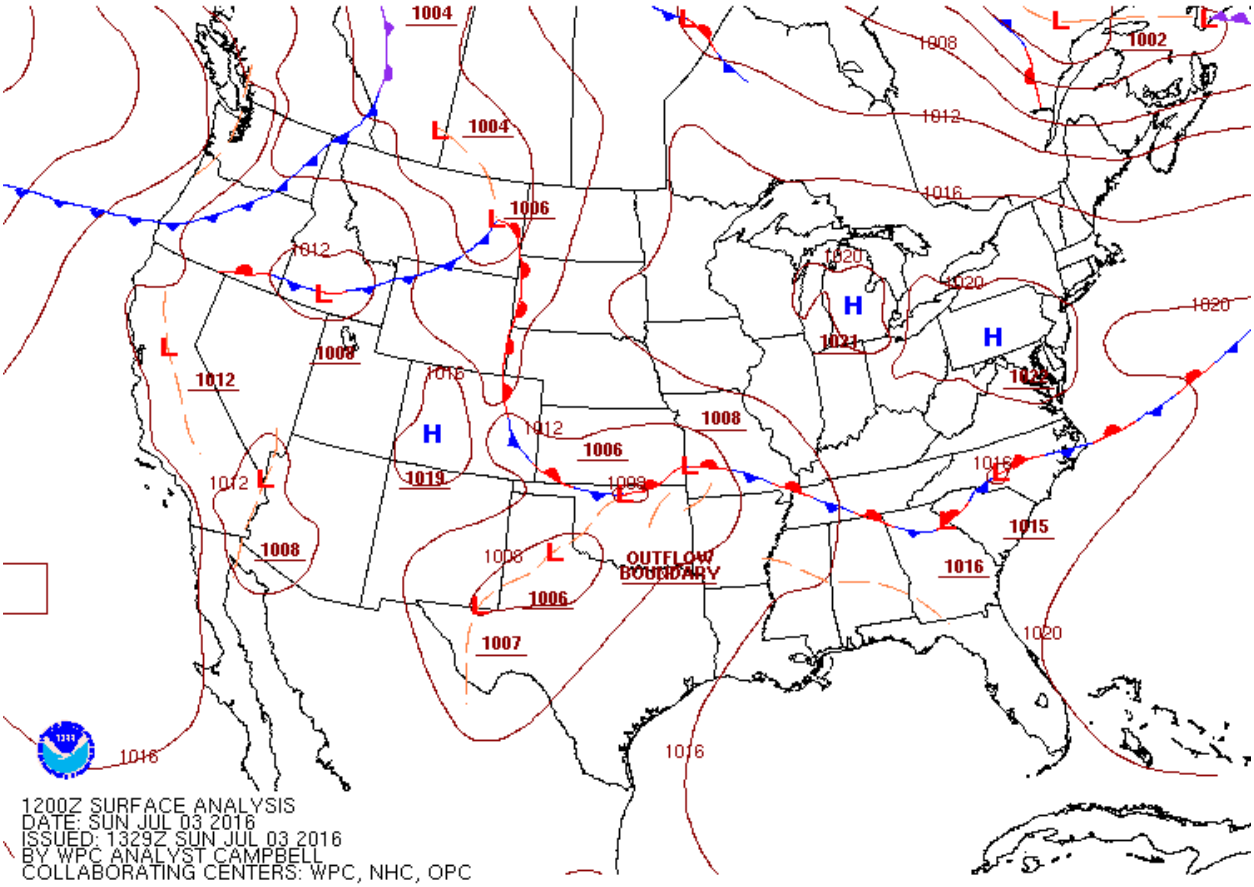

Satellite Image with AOD – May 13, 2015

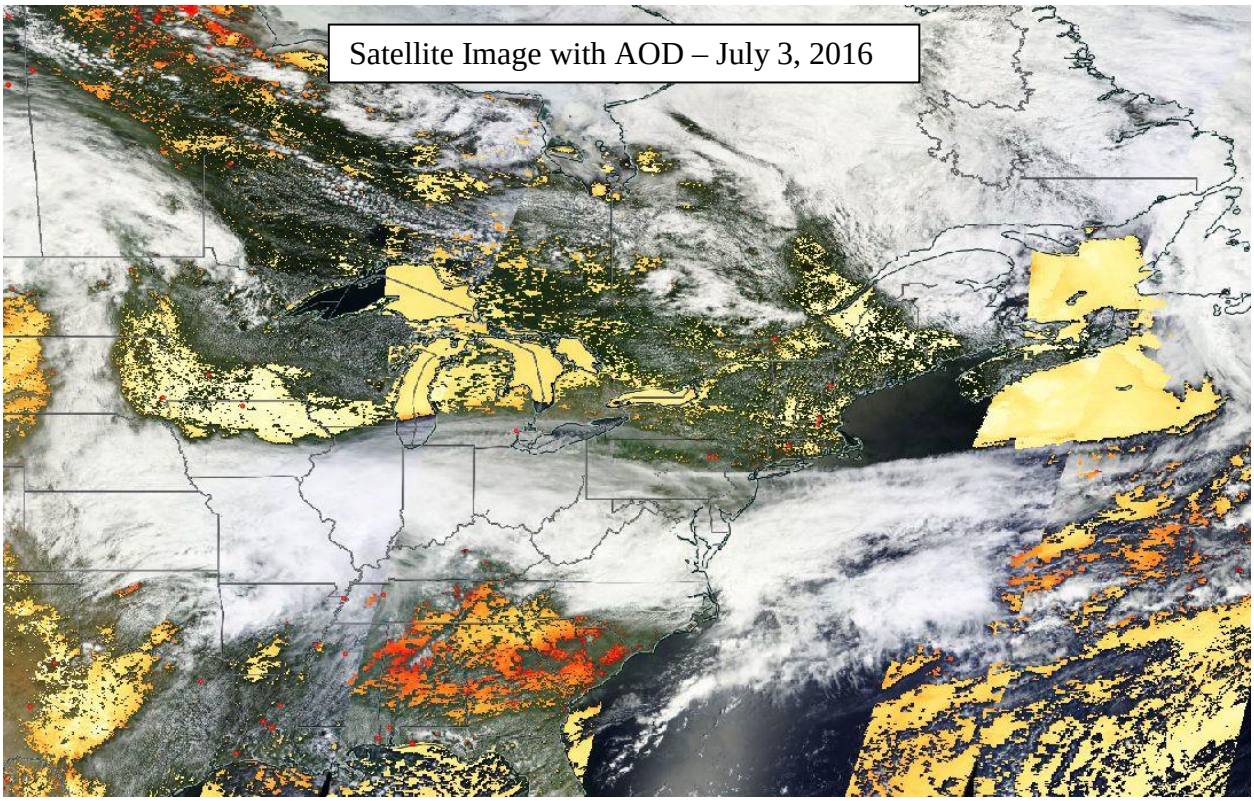

NOAA/ESRL Physical Sciences Division
850mb Geopotential Height (m) Composite Mean
7/3/16
NCEP/NCAR Reanalysis


NOAA HYSPLIT MODEL
Backward trajectories ending at 1600 UTC 03 Jul 16
NAM Meteorological Data
Source ★ at 41.84 N 73.25 W
Meters AGL

Daily Ozone AQI
Sunday, July 03, 2016
Montpelier
Portland
Utica
Albany
Boston
Scranton
New York
Pittsburgh
Philadelphia
0 15 30 60 Miles
Generated: 2016-07-05 15:58:02Z

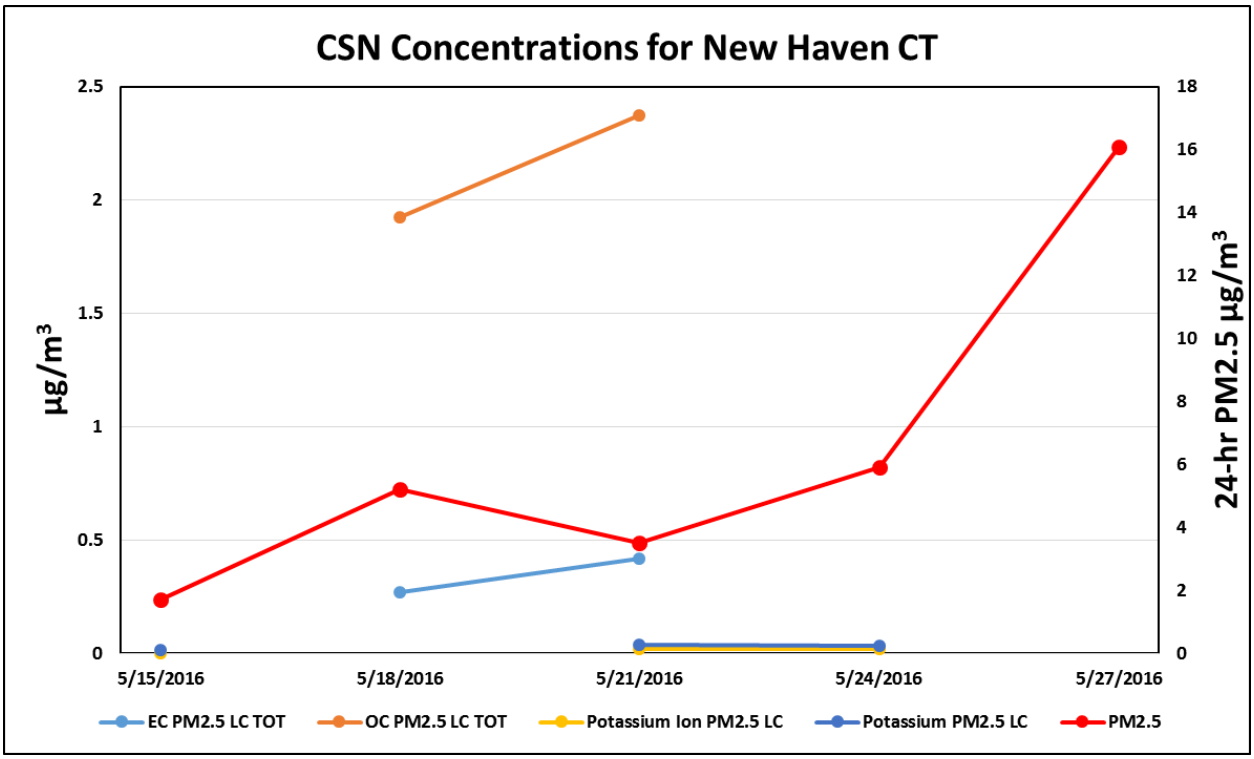

Hourly PM2.5 and Ozone- July 3, 2016
PM2.5 µg/m3
Ozone ppb
0
5
10
15
20
25
30
35
40
0
10
20
30
40
50
60
07/03/2016 00:00
07/03/2016 04:00
07/03/2016 08:00
07/03/2016 12:00
07/03/2016 16:00
07/03/2016 20:00
Cornwall-PM2.5
East Hartford-PM2.5
Cornwall Ozone
E Hartford Ozone


1200Z SURFACE ANALYSIS
DATE: SUN JUL 03 2016
ISSUED: 1329Z SUN JUL 03 2016
BY WPC ANALYST CAMPBELL
COLLABORATING CENTERS: WPC, NHC, OPC
OUTFLOW BOUNDARY



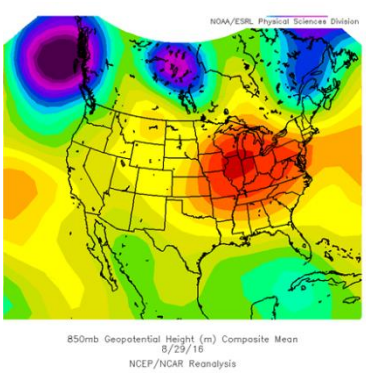

2) *CT DEEP should provide figures similar to Figures 32-38 for Chemical Speciation Network (CSN) sites in CT (New Haven) and New York City. The CSN monitors in CT were sampled on May 24 and May 27 and may show evidence of smoke in the area*.

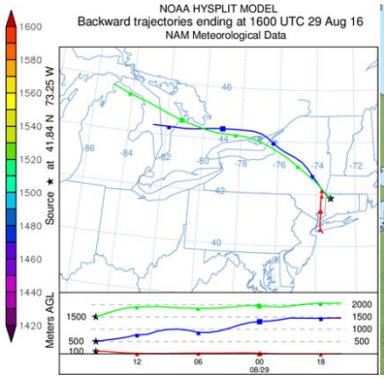
**Response: As mentioned before, we believe that those dates for sites around Connecticut add little value to the demonstration. The following graph shows the plotted values for the New Haven CSN parameters, however, the dataset was incomplete. As expected, values were low through May 24th and PM2.5 did increase on May 27th, but no other parameters were available.**

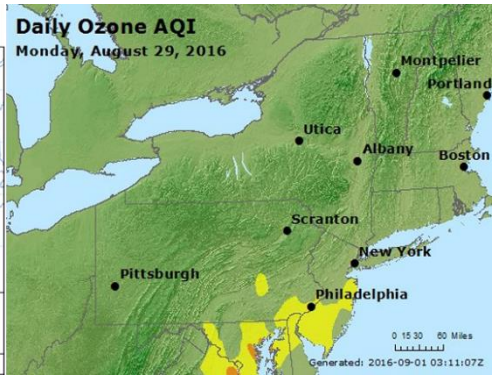


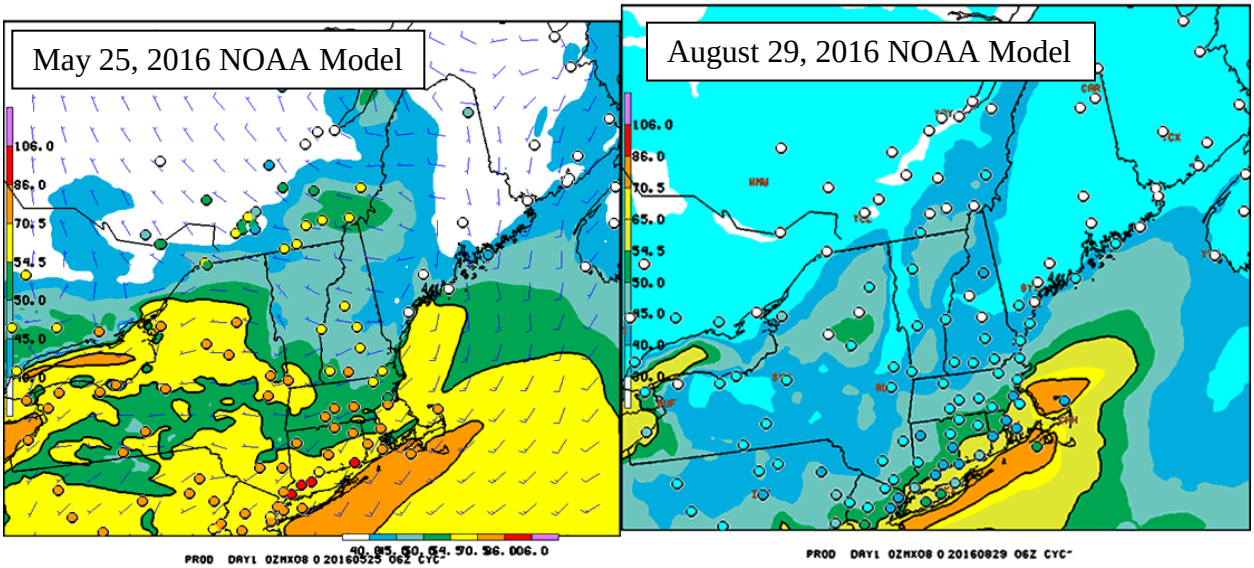

3) *Section 3.6 on page 53 says "from the previous similar day analysis, August 29th 2016 was determined to have a similar weather pattern as May 25th but no analysis was provided for this day in Section 3.3. CT DEEP should provide the analysis for August 29, 2016 similar to Figures 45-47.*

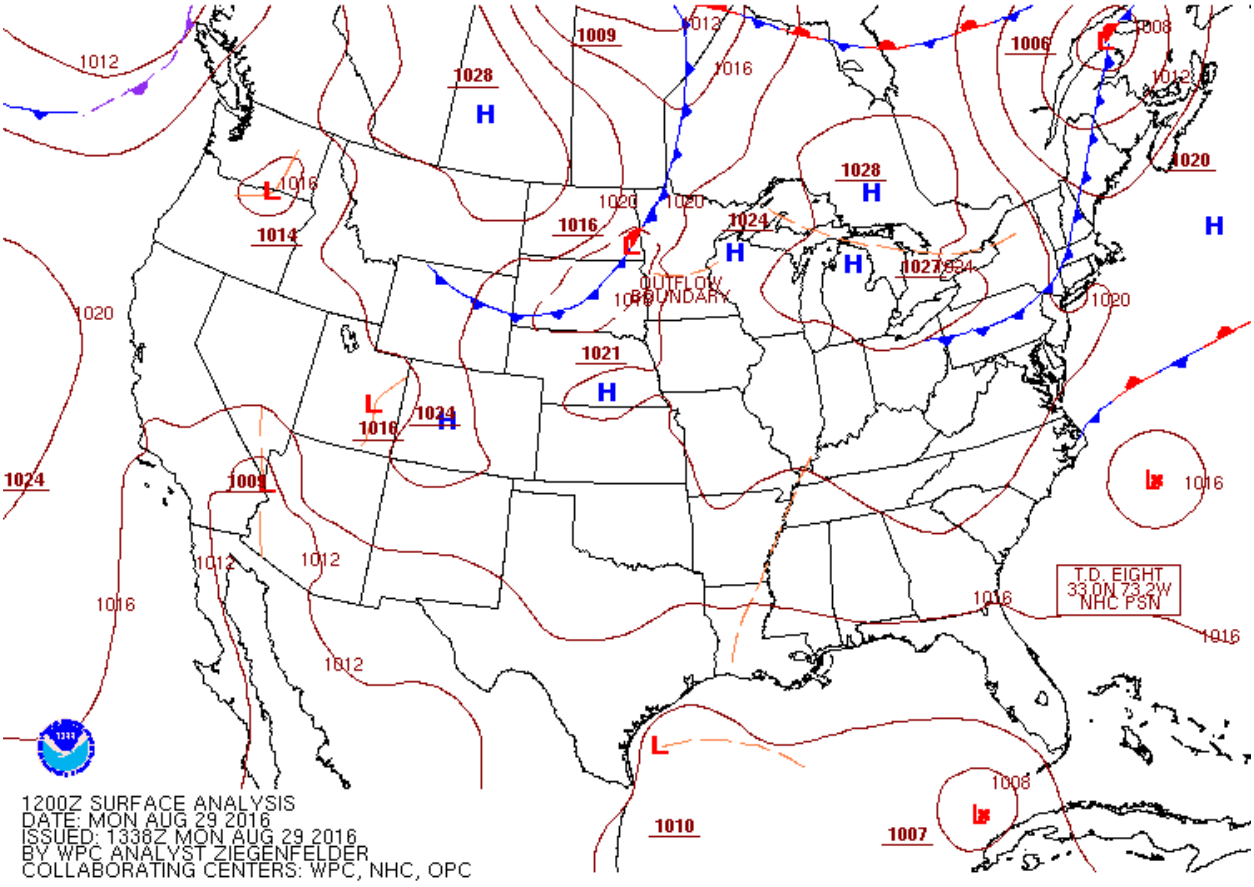
**Response: Several more days were analyzed as similar days, but we included only four that we felt were the best comparisons. August 29th was only mentioned in the model comparison section because it showed a similar model output as that of May 25th, 2016, although there was less moderate ozone forecast. The following is the 3-panel image from August 29th showing a similar 850mb pattern, back trajectories and good air quality for Connecticut. The surface analysis shows a weak cold front approaching.**



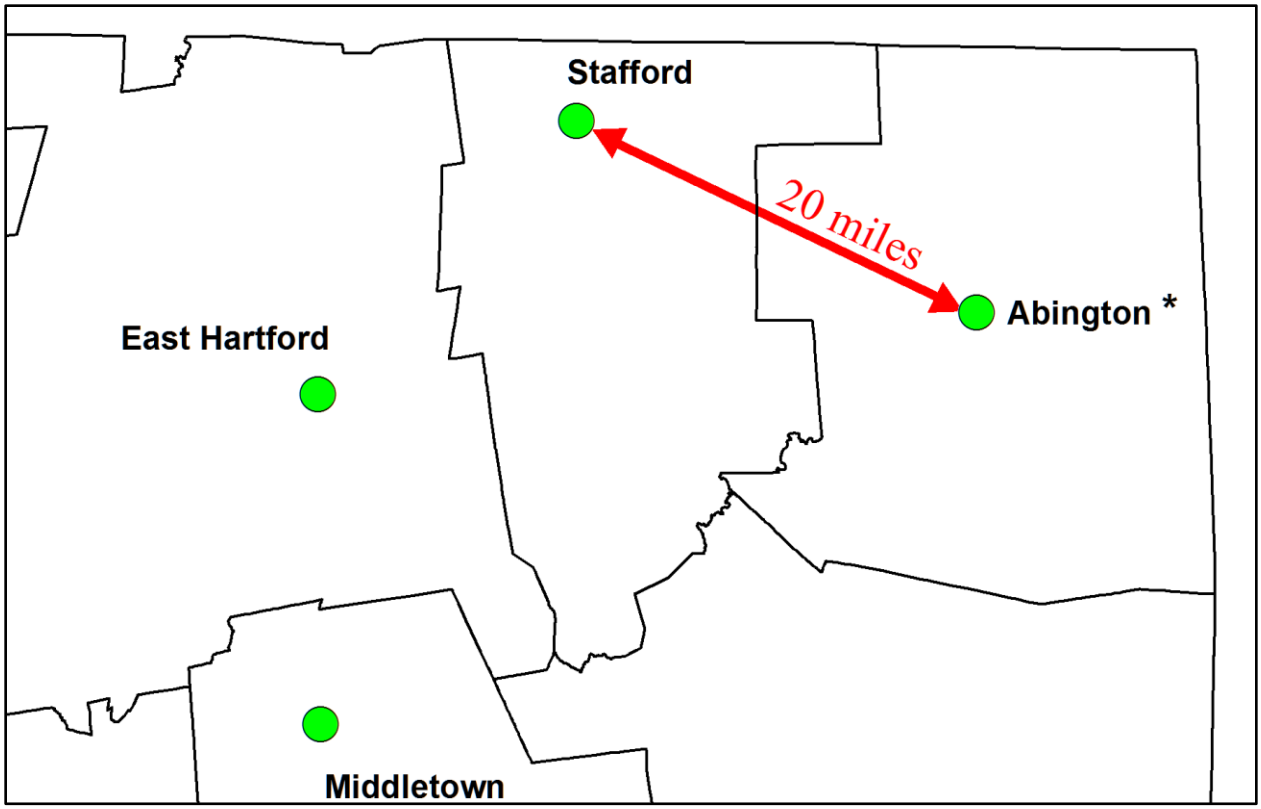
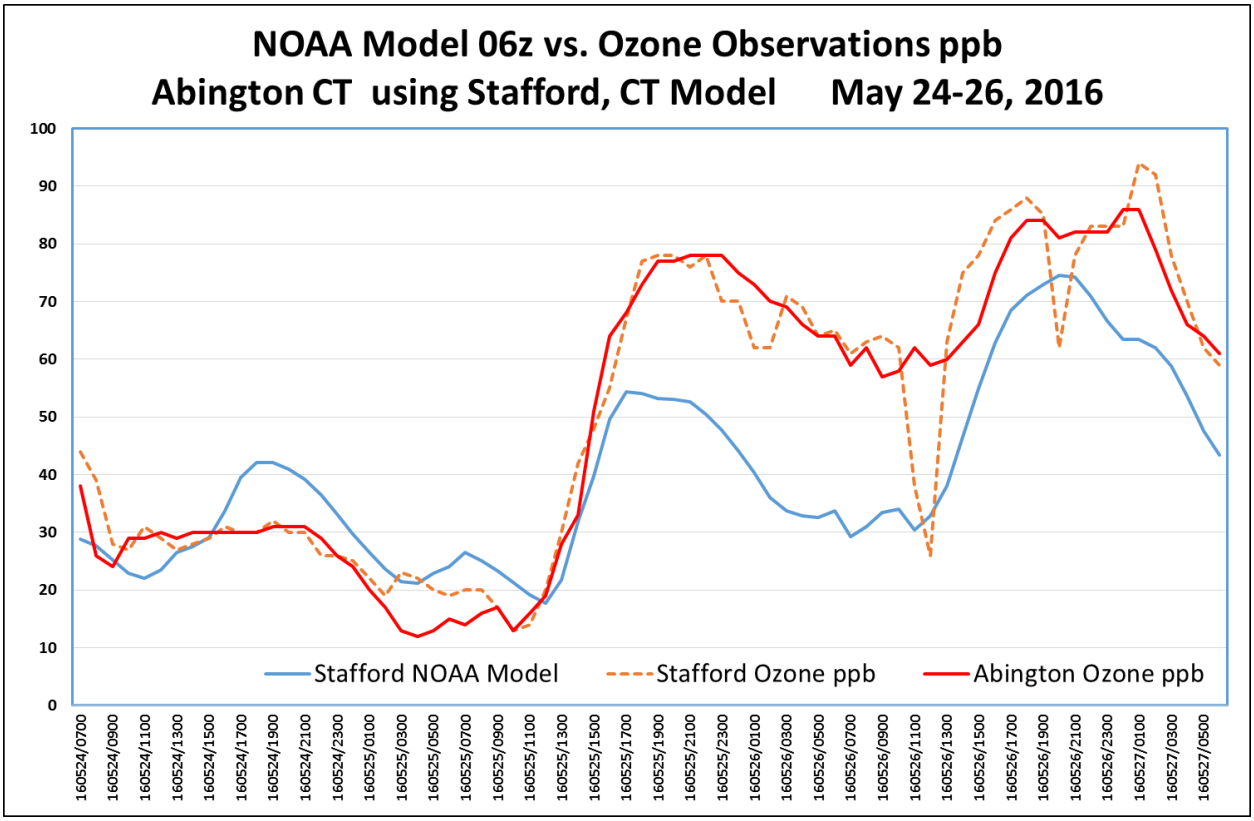






4) *CT DEEP should provide a figure for the Abington site similar to Figures 59-61 for Cornwall, East Hartford, and Westport.*

**Response: Hourly model point data was not provided by NOAA for this site, however a similar comparison can be made by using point model data provided for our nearby site at Stafford (See map below). The ozone data traces appear similar for these sites (see figure below), except for a few hours when Stafford experienced a wind shift on May 26th. Model bias can be**

**observed to be under predicting by 20-30 ppb on May 25th and 10-20 ppb on May 26th. This is consistent with model performance at the other sites that were analyzed.**